

Comprehensive Quality Assurance Site Survey

98-MP27.02 (A336)

Fredrick L. Burriell, Air Pollution Specialist

California Air Resources Board

1309 T Street

Sacramento, CA 95814

ABSTRACT

The California Air Resources Board (CARB) developed the Comprehensive Quality Assurance Site Survey (Survey) as a means of evaluating the performance of ambient air monitoring stations within California. Each station is assessed, using the Survey, to determine the accuracy and representativeness of data being generated. CARB has incorporated into the Survey siting criteria set forth by the United States Environmental Protection Agency (U.S. EPA) in 40 CFR 58. Each year, a thorough evaluation is made at each station for such criteria as sampler model, purpose, objective, residence time, scale, station temperature, obstacles, traffic, local sources, and dominant influence. While most ambient air monitoring stations carefully adhere to regulations during the initial site setup, as reflected by their site reports, changes occur over time that are overlooked by the station operators. Some changes that occur include: scaling problems, source problems, obstacles, and temperature requirements. Assessing and tracking these changes, through use of the Survey, and by conducting independent performance audits, enables QAS staff to detect or prevent any discrepancies that may occur. If a discrepancy is noted, an Air Quality Data Action (AQDA) may be issued. An AQDA is used to determine if corrective action is needed for the data, and as a reminder to the station operator to bring the station back into compliance with the current siting criteria. The AQDA also alerts the possible data users that the data may no longer be representative, allowing them to make an informed decision on representativeness of the data for their particular use. Through continual assessment of current ambient air monitoring siting criteria, and requiring compliance, we confirm that data generated from each site are accurate and representative of the U.S. EPA and CARB air monitoring goals.

INTRODUCTION

The California Air Resources Board (CARB) has the responsibility of overseeing the implementation of the California Clean Air Act, as well as the Federal Clean Air Act. As such, one of the primary concerns of the Monitoring and Laboratory Division's Quality Assurance Section (QAS) is to validate the process in which ambient air data is collected.

One way the QAS staff validate data collection is through on-site reviews of the ambient air monitoring stations. It is assumed that all stations met existing siting requirements when they began operation. Any non-conformance today is expected to be the result of changes in regulations, surrounding conditions, or land use. The siting criteria requirements set forth in California and federal regulations are designed for the collection of accurate and representative data. Some of these siting criteria are designated as "must meet", while other criteria are designated as "should meet". In accordance with 40 CFR 58, Appendix E, the "must meet"

requirements are necessary to ensure high quality data collection, while the "should meet" criteria establish a goal for data consistency. To generate accurate and representative data, all ambient air monitoring stations must meet the current siting requirements and conditions. However, detailed assessment of siting conditions conducted through site report evaluations and during independent performance audits indicates that data from ambient air monitoring stations, at times, do not always meet the siting criteria.

To verify that stations are operating correctly and meet current siting criteria, the QAS developed the Comprehensive Quality Assurance Site Survey (Survey) for stations that report data to the Aerometric Information Retrieval System. The Survey is a valuable tool for assessing and supplementing the site reports by providing current information about siting conditions and overall site operation.

COMPREHENSIVE QUALITY ASSURANCE SITE SURVEY

The goal of the CARB is to report only good quality data, and the Survey (Table 1) has proven valuable in identifying and correcting problem areas. The Survey enables QAS staff to verify that ambient air monitoring stations operating within the jurisdiction of the CARB continually meet siting criteria. Performance audits by independent auditors are conducted at most ambient air monitoring stations; however, this does not always provide a complete measure of data validity. Using the Survey, QAS staff make a thorough on-site evaluation of each operating and siting parameter during the annual performance audits. This evaluation includes: instrumentation, site location and description, probe residence time, station temperature, nearby obstacles, spatial scale, objective, quality assurance activities, local sources, and dominant influence. These thorough evaluations, along with independent performance audits, have revealed that some stations in operation do not meet current siting criteria, and this can greatly effect data quality and representativeness.

IMPLEMENTATION

Site Reports

Site reports are submitted to CARB each time a site is initiated or modified. The information for initial site set-up is evaluated for compliance with current siting criteria, and discrepancies are discussed with the site operator. The information from site reports are entered onto a new Survey or appended to an existing Survey, and the items entered are noted under action items to be checked and confirmed in the field. These items are carefully evaluated during the next on-site review.

On-Site Reviews

An on-site review consists of a field review and verification that siting conditions meet their original objective. They are conducted at the same time as annual performance audits. The on-site review entails collecting and recording all information and measurements onto the Survey. Discrepancies between the reported and observed conditions are investigated to establish the

correct information. If necessary, the station operator is requested to submit an amended site report.

The QAS staff have found that certain siting criteria discrepancies occur more frequently than others. These major areas of concern are residence time, monitoring objective and spatial scale, nearby obstacles, and station temperature.

Residence Time

Residence time is defined as the time it takes for ambient air to transit the probe inlet to the sampling device. To minimize the various adverse effects of residence time on data quality, the U.S. EPA set 20 seconds as a maximum residence time for reactive gas monitors. To verify station compliance with this requirement, QAS staff evaluate all components within the sampling system (Table 1, page 5). This is accomplished by measuring all instrument and secondary pump flow rates, as well as the length and inside diameter of the probe, manifold, and all connecting tubing. Residence time is calculated using the formula on Table 1, page 5.

QAS staff have found that replacing high-flow instruments with low-flow instruments commonly increases the residence time. This is often overlooked by the station operator, and is not found until the residence time is recalculated when completing the Survey.

Monitoring Objective and Spatial Scale

When a site is initially selected and a station is set up, it is individually evaluated for monitoring objective and spatial scale of representativeness. This provides a basis for the interpretation and application of the data. However, as land uses change, sites need to be evaluated using the current siting criteria. The QAS staff make a determination based on the current traffic volume data for the area, and the physical location of the station with respect to the roadways.

Nearby Obstacles

The primary issue with regard to obstacles is the encroachment of trees on the sample probes. This can have a rather profound effect on data representativeness, since the trees have a destructive interference with many reactive pollutants and particulate matter. The QAS staff measure the distance to the tree drip-line and height of the tree above the probe inlet during the Surveys. QAS staff determine whether the site meets the requirements using criteria set forth in 40 CFR 58, Appendix E.

Station Temperature

The U.S EPA Volume II establishes a "should" meet criteria for the station inside temperature of 20° to 30° Celsius. However, the U.S. EPA List of Designated Reference and Equipment Methods provides a "must" meet criteria during the samplers' reference or equivalent testing. If the QAS staff measure a station temperature that is outside the 20° to 30° Celsius limit, they check to verify each analyzer's reference or equivalent method allows operation at the measured temperature.

The QAS staff strongly encourage station operators to use a continuous temperature recording device to allow the operator to flag data outside of acceptable temperature limits.

AQDA Issuance

An Air Quality Data Action (AQDA) is issued for all parameters that deviate from current siting criteria and effect data quality. The AQDA informs the station operator of an existing siting criteria deficiency so the station can be brought back into compliance. It also places a temporary hold on submittal of any recent data to AIRS.

AQDA Resolution

Resolution of an AQDA issued for a siting criteria can be as simple as trimming trees, raising the inlet probe height, increasing the probe flowrate, or changing the monitoring scale. It may be as extensive as relocation of the monitoring station. Although QAS's primary interest is in correcting siting deficiencies, data deletion is examined on a case by case basis.

An alternative for resolving an AQDA is to apply for a waiver under 40 CFR 58, Appendix E, Section 11. Whether the U.S. EPA approves a waiver depends on the sensitivity of the data to the non-compliant condition, the purpose for monitoring, and the ambient concentration levels relative to the ambient air quality standards.

CONCLUSION

Use of the annual Survey over the past few years has enabled CARB to correct many siting criteria problems. Inaccurate data have been corrected or deleted, and data users have been alerted to the siting deficiencies. Most importantly, the Survey has been a very powerful tool in maintaining the integrity and accuracy of the ambient air quality data. When on-site visits are conducted today, it is evident that many of the station operators have made every effort to maintain the site in accordance with current regulations and guidelines.

REFERENCES

1. Air Monitoring Quality Assurance, Volume II, California Air Resources Board, June 1978.
2. Code of Federal Regulations, Title 40, Part 58, Appendix E, U.S. EPA, the Office of the Federal Register National Archives and Records Administration, July 1997.
3. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, U.S. EPA, Office of Research and Development Atmospheric Research and Environmental Assessment Laboratory, EPA-600/4-77-027a, April 1994.
4. Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), U.S. EPA, Monitoring and Data Analysis Division, Office of Air Quality Planning and Standards and Environmental Monitoring Systems Laboratory, Office of Research and Development, EPA-450/4-87-007, May 1987.

5. Photochemical Assessment Monitoring Stations Implementation Manual, U.S. EPA, Office of Air Quality Planning and Standards, EPA-454/B-93-051, March 1994.
U.S. EPA Reference and Equivalent Methods for Ambient Air, October 1, 1996.